COMPARISON OF EUROCODE 2 AND BS 8110 RECOMMENDATIONS FOR THE DESIGN OF BENDING AND DEFLECTION IN SIMPLY SUPPORTED ONE WAY SLABS

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Specially dedicated to my beloved family, teachers and friends…

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Abstract

Recently in Sri Lanka, design of the civil structures is adopted by Eurocodes superseded by the British code of practices. For reinforced concrete structures the Eurocode 2 will became of paramount importance to the design of the structural members. Bending and deflections are most important governing criteria in designs of slabs. Both standards for reinforced concrete design to check the deflection control by mean of minimum member thickness requirement and a direct computation method. This research covers an analytical study that compared maximum span to depth ratios on deflection on different influence factors in simplified method and rigorous method. One-way slab on simply supported slab was considered to compare the parameter to compare in the research.

Further the deflections were compared with an experimental result produce by Gilbert (2004) with numerical calculation with respect to both code recommendation and its reliability was discussed. The influence factors on deflection and bending were analyzed in term of sensitivity factors to understand the variation on results. The results indicated the EC2 predict less area requirement for the flexure and a very thin slab can be used to control deflection if the applied moment not induced any crack in the element and the increased in tensile strength and Elasticity of concrete provide more sophisticated deflection control compared to the BS 8110.

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LIST OF ABBREVIATIONS

Notation is commonly in accordance with Eurocode 2 and the principal List of Acronyms and Abbreviations are presented below.

The common system of subscripts such that the first subscript refers to the material, such as (c - concrete and s - steel), and the second subscript refers to the form of stress, such as (c – compression and t - tension).

Abbreviation	**Description**
E	Modulus of elasticity
F	Load (action)
G	Permanent load
I	Second moment of area
M	Moment (bending moment)
Q	Variable load
a	Deflection
b	Breadth (width)
d	Effective depth
d'	Depth to compression reinforcement
h	Overall depth of section in plan of bending
i	Radius of gyration
k	Coefficient
l	Length (Span)
n	Ultimate load per unite area
$1/r$	Curvature of a section/bending
t	Thickness
x	Neutral axis depth
z	Lever arm
A_c	Concrete cross-section area
A_s	Cross-section area of tension reinforcement
A_s’	Cross-section area of compression reinforcement
A_{sreq}	Cross-section area of tension reinforcement required at the ultimate limit state
$A_{s,prov}$	Cross-section area of tension reinforcement provided at ultimate limit state
E_{cm}	Secant modulus of elasticity of concrete
E_s	Modulus of elasticity of reinforcing (prestressing steel)
G_k	Characteristic permanent load
I_c	Second moment of area of concrete
M_{bal}	Moment on a column corresponding to the balanced condition design value of moment
M_{Ed}	Design value of moment

M_u	Ultimate moment of resistance
Q_k	Characteristic variable load
b_w	Minimum width of section
f_{ck}	Characteristic cylinder strength of concrete
f_{cm}	Mean cylinder strength of concrete
f_{ctm}	Mean tensile strength of concrete
f_{yk}	Characteristic yield strength of reinforcement
g_k	Characteristic permanent load per unit area
k_1	Average compressive stress in the concrete for a rectangular parabolic stress section
k_2	A factor that relates the depth to the centroid of the rectangular parabolic stress section and the depth to the neutral axial
l_a	Lever arm factor = z/d
q_k	Characteristic variable load per unit area
n	Modular ratio
ψ	Action combination factor
γ_c	Partial safety factor for concrete strength
γ_G	Partial safety factor for permanent loads, *G*
γ_Q	Partial safety factor for variable loads, *Q*
γ_s	Partial safety factor for steel strength
δ	Moment redistribution factor
ε	Strain
σ	Stress
Ø	Bar diameter
b_{eff}	Effective width of the concrete flange
E_s	Modulus of elasticity of steel
$E_{c,eff}$	Effective modulus of elasticity of concrete
E_{cm}	Secant modulus of elasticity of concrete
F_{cm}	Mean value of the axial tensile strength of concrete
h	Overall depth (thickness)
h_f	Thickness of the concrete flange
δ	Deflection at mid span
γ	Factor of safety

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